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Validation System - Functional Description for the Generation-3 Personnel Safety System (PSS) of the Advanced Photon Source at Argonne National Laboratory 9700 Cass Avenue Argonne, Illinois 60439

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1. Introduction

1.1 Purpose

This Functional Description contains the necessary information to understand how the Validation System for the Personnel Safety System (PSS) is to operate.

1.2 Scope

This Functional Description is limited in scope to the general operation of the Validation System. For information on its use during validation refer to the PSS Validation Procedure.

The Validation System is the name of an independent system whose function is to validate the Emergency Shutdown System (ESD) portions of the PSS. This is accomplished by injecting test signals into the PSS and verifying that the system outputs change appropriately for the simulated conditions. The System Interlock Group (SI) of the Accelerator System Division (ASD) is responsible for the development and maintenance of the Validation System at the APS.

1.3 References

The following documents form a part of this functional description to the extent specified herein. In the event of conflict between the documents referenced herein ant the contents of this functional description, the contents of this functional description shall be considered a superseding functional description.

Government Documents:

Department of Energy (DOE) ORDER 420.2A, 01-08-01
Accelerator Safety Implementation Guide for DOE O 420.2A, Draft, August 2001
DOE ORDER 5480.25, 11-3-92
DOE GUIDANCE 5480.25, September 1, 1993

DOE ORDER and GUIDANCE 5480.25 are included because they were in effect and referenced when the Safety Assessment Document (SAD) was originally written; it has been superseded by DOE ORDER 420.2, which has been superseded by DOE ORDER 420.2A. DOE ORDER 420.2(A) essentially made the approved SAD the effective regulatory document.

1.3 References Continued

Copies of specifications, standards, drawings and publications required by suppliers in connection with specified procurement functions should be obtained from the contracting agency or as directed by the contracting office.

Non-Government Documents
The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.
Environment Safety & Health Manual, Section 5.16 (ES&H 5.16) April 25, 2003, Argonne National Laboratory.
APS Safety Assessment Document (SAD), Rev 1, May 1999, Argonne National Laboratory, Argonne, IL.

Compliance with the following required by SAD:
Stanford Linear Accelerator Center Report 327 (SLAC 327), April 1988, Stanford Linear Accelerator Center, Menlo Park, CA.
National Council on Radiation Protection Report No. 88 (NCRP 88), Issued 30 December 1986, National Council on Radiation Protection.
Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies.

Document No. 1111-00001-00 APS Quality Assurance Plan, dated May 1990.

Validation System Requirements Specifications for Gen-3 PSS
Validation System Input/Output Listing for Gen-3 PSS

1.4 Definitions, acronyms, and abbreviations

The following are some of the frequently appearing or unique words or phases used in this document.

These definitions are provided as a quick reference for the reader's convenience.

Mezzanine equipment: This refers to the equipment in the PSS cabinet located on the mezzanine

Station: In this document the term applies to each enclosure which has a PSS station control box associated with it.

Test Cart: This is the main component of the Validation system. It contains the main processor and the Operator interface.

Test Box: A remotely operated interface to the PSS. There is one for each station after the First Optical Enclosure (FOE) and one for the Front End Relay Distribution Panel (FERDP)

The following are some of the frequently appearing or unique acronyms used in this document. This list is provided as a quick reference for the reader's convenience.

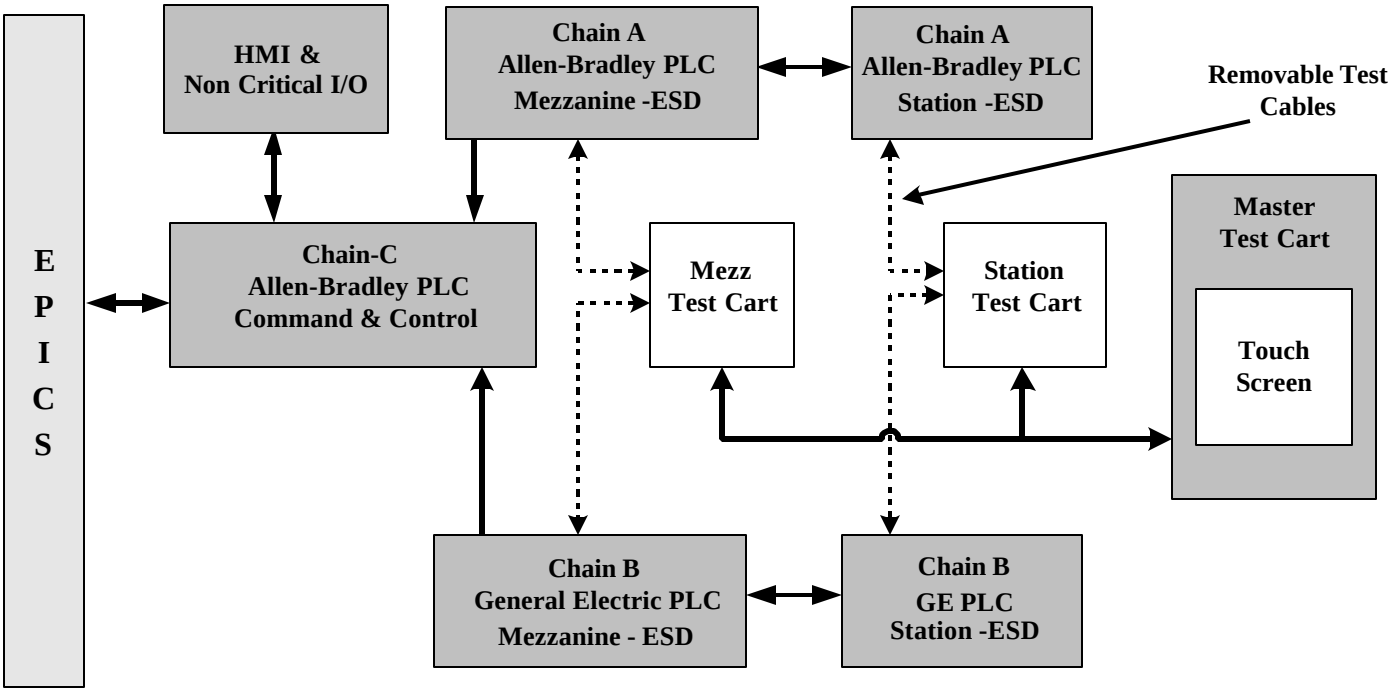
ASD	Accelerator System Division
ESD	Emergency Shutdown System
FERDP	Front End Relay Distribution Panel
FOE	First Optical Enclosure
PSS	Personnel Safety System
SI	Systems Interlock Group

2. General system description

2.1 System Content

The Validation System shall consist of a main Test Cart and remote Test Boxes, which in turn interface with the PSS under validation. The following block diagram shows the relationships between the Test Cart, Test Boxes, and the ESD portion of the PSS

Validation System Block Diagram



3. Validation System Functions

3.1 Signal Injection

The Validation System shall allow the operator to independently inject a signal for each input of the ESD portion of the PSS. The system shall allow the operator to independently inject a signal for any critical path for which the ESD portion of the PSS provides permits for. This will allow the operator to simulate both normal and fault situations.

3.2 Output monitoring

The system shall allow the operator to independently monitor every output of the ESD portion of the PSS. The system shall also allow the operator to independently monitor the output of any critical path for which the ESD portion of the PSS provides permits for.

3.3 Connection detection

The Validation System shall monitor its connection to the PSS. The Validation System will indicate if a connection is missing and inhibit signal injection to the PSS.

4. Testing the Validation System

The Validation System shall be tested point by point. There will be a written test procedure for testing the Validation System. Each Validation System output (ESD Systems inputs) will be activated and the tester will verify that only the activated output is on. This Validation System output will then be deactivated an the tester will verify there are no Validation System outputs on. This test will be repeated for each Validation System output. Each Validation System input (ESD Systems outputs) will have a signal injected at the PSS connection and the tester will verify that only the indicator for that activated input turns on. This test will be repeated for each Validation System input. The Validation System may be used to validate the PSS ESD systems only after successfully passing this test.

5. Testing the PSS ESD Systems

The PSS ESD systems shall be tested using a stimulus response test method. The Beamline written validation procedure will control the test process. Each Validation System output (ESD Systems inputs) will be activated and proper response of the PSS ESD will be verified. This will include testing for correct response to normal stimulus and also correct response to abnormal stimulus. The Beamline validation procedure will use a combination of white and black box methods to exercise every PSS ESD system behavior. The ESD system must respond correctly to all of the Beamline validation procedure tests to be released for user operations.